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COMPARATIVE ANALYSIS OF DOSIMETRIC PLANS WITH SIMULTANEOUS DOSE ESCALATION FOR PROSTATE TUMORS IN THE APPLICATION OF BIOLOGICAL AND PHYSICAL OPTIMIZATION FUNCTIONS

Tuesday, 12 July 2022 18:10 (20 minutes)

Purpose of the work. a comparative analysis of radiation therapy (RT) plans with simultaneous dose escalation for prostate tumors in the application of biological and physical optimization functions.
Research methods. In this research, dosimetric plans with volumetric modulated arc therapy (VMAT) were developed for nine patients diagnosed with prostate cancer in the Simultaneous integrated boost (SIB) mode. RT was conducted in the following fractionation mode: the prescribed dose per course of radiotherapy for SIB was 75 Gy, the number of fractions was 25, so that the single focal dose was 3 Gy for PTV1 (prostate region), 2.5 Gy for PTV2 (prostate and seminal vesicles) and 2 Gy for PTV3 (prostate, seminal vesicles and regional lymph nodes) [1].
Dosimetric planning for SIB was performed in the Monaco environment (version 5.51.10) using VMAT. All the dosimetric irradiation plans had the same technical calculation parameters. Several therapeutic plans with different optimization functions were created for comparative analysis: physical; biological; a combination of physical and biological optimization functions. The acceptable level of prescribed dose was greater than 95% of the volume of each treatment site. A maximum dose of 107% of the prescribed dose was allowed for <2% of PTV1. Dose volume limits for OAR: for rectum: V74≤15%; V69≤20%; V64≤25%; V59 ≤35%; for bladder: V74≤25%; V69≤35%; V64≤50%; for femoral heads: V45<10% [2].
Results. The dose distribution in the clinical target volume for all VMAT-SIB plans was in the range of at least 95% of the prescribed dose covering at least 95% of the target volume. Radiation exposure levels to OAR did not exceed tolerated levels. A comparison of dosimetric plans showed that the best optimization of the PTV1 is achieved when only the physical functions are used. However, OAR receive less dose when only biological optimization functions are used.
Conclusion. The dose distribution results have shown that it is possible to create clinically acceptable dosimetric plans when only biological or physical optimization functions are used separately. Comparison of the obtained results shows that the most optimal dosimetric plan is achieved when using a combination of biological and physical optimization functions.

The speaker is a student or young scientist

Yes

Section

1. Nuclear technology and methods in medicine, radioecology

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